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EXAMINER

GUERRERO, M

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 08/18/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/002,178

Applicant(s)
Bohr

Examiner
Maria Guerrero

Group Art Unit
2822



☒ Responsive to communication(s) filed on Mar 8, 1999

☐ This action is FINAL.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-20 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-20 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☒ The drawing(s) filed on Dec 31, 1997 is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 6

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

1. This Office Action is in response to Election and Amendment filed January 25, 1999.

Election/Restriction

2. Applicant's election without traverse of Group II, claims 1-20 in Paper No. 5 is acknowledged.
3. Claims 21-30 are canceled.

Drawings

4. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

Claim Objections

5. Claim 14 is objected to because of the following informalities: the claim recited "electroplating plating"; in line 2. Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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7. Claims 1-5 and 11-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites "a semiconductor substrate", lines 1-2; "a substrate", lines 2-3. It is unclear if the claim is referring to the same semiconductor substrate.

Claim 11 recites the limitation "said second dielectric and said first dielectric" in lines 9-10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Kunieda et al. (U.S. 4,941,810).

10. Kunieda et al. discloses forming a first dielectric layer 16 (dielectric constant is 4) over a metal interconnect layer on a substrate 10, the metal interconnect layer including a bond pad and a metal member space apart from the bond pad by a gap (see fig. 1), forming a second dielectric layer 18 (dielectric constant is 8); the dielectric constant of the second dielectric layer is larger

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than the first dielectric layer (see col. 1, lines 50-68, col. 2, lines 28-35) (the second dielectric layer being hermetic, it is inherent). It is also teaching, the first dielectric layer comprises silicon dioxide; the second dielectric layer comprises silicon nitride; the second dielectric layer is thinner than the first dielectric layer (see col. 1, lines 65-68).

11. Claims 1, 3-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Byrne (U.S. 5,369,299).

Byrne teaches a first dielectric layer 30A (silicon dioxide), a second dielectric layer 30B (silicon nitride layer) (it is known in the art that silicon nitride has a higher dielectric constant than silicon oxide), a metal interconnect layer on a substrate, the metal interconnect layer including a bond pad 24, and a metal member 23 spaced apart by a gap; the protective seals keeps out moisture (see fig. 1, Abstract, col. 3, lines 35-60, col. 4, lines 45-65).

12. Claim 11 is rejected under 35 U.S.C. 102(b) as being anticipated by Havemann (U.S. 5,565,384).

13. Havemann discloses conductors 18 separated by gap 20; forming a first dielectric layer 22 wherein said gap is completely filled by the first dielectric layer, forming a second dielectric layer 24 over the first dielectric layer 22, the second dielectric layer has a higher dielectric constant (3.9) than the first dielectric layer, forming an opening through said second dielectric layer and said first dielectric layer to exposed the top surface of at least one of the spaced apart members (see figs. 1A-1D). Referring to fig. 7, it is teaching an organic-containing layer 54, an inorganic layer 56, a silicide 48 (it is a barrier metal inherent), forming a contact (see fig. 7,

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Abstract, col. 1, lines 55-65, col. 2, lines 25-65, col. 3, lines 1-10, 50-67, col. 4, lines 1-25, 45-55, col. 6, lines 20-67).

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrne (U.S. 5,136,364).

Byrne '364 discloses a substrate 10, a bonding pad 11, a two component passivation layer, a first dielectric layer (silicon dioxide), a second dielectric layer (silicon nitride) (it is known in the art than silicon nitride has a higher dielectric constant than silicon oxide) , a third dielectric layer can be a polyimide layer, forming an opening to exposed the top surface of the bonding pad, depositing a barrier layer. It is teaching typically bumps are connected to the bonds pads. It also discloses a barrier layer comprising a nickel-vanadium layer; it has to be common to provide hermetic packaging.

16. Claims 1-5, 11-13, 15, 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrne (U.S. 5,136,364) in view of Byrne (U.S. 5,369,299) (previously applied).

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Byrne '364 does not specifically show the metal member being spaced apart from the bond pad by a gap as claimed. Nevertheless, this is conventional in the art as evidenced by Byrne '299 (see above).

Byrne '299 cited "a more complete description of the protective seal is disclosed in U.S. Pat. No. 5,136,364 to Byrne which is incorporated herein by reference in its entirety", see col. 4, lines 64-66).

It would have been obvious to a person of ordinary skill in the art to include the metal member spaced from the bond pad by a gap as taught by Byrne '299 because it would complete a semiconductor process which could provide a seal for a semiconductor device and it could exclude contaminants from the critical parts. In addition, Byrne '364 discloses as a practical manner, layers are applied over the entire IC wafer (see col. 2, lines 25-30).

17. Claims 9-10, 14, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrne '364 as applied to claims 1-8, 11-13, 15, and 17-19 above, and further in view of Mis et al (U.S. 5,767,010)

Mis et al. discloses a bump formed by electroplating techniques known to those having skill in the art, a barrier layer comprising a lower titanium layer (see figs. 5-6, 11-12, Abstract, col. 2, lines 15-55, col. 4, lines 5-20, col. 5, lines 15-20).

It would have been obvious to a person of ordinary skill in the art to modify Byrne's process by teaching the bump by electroplating and including a lower titanium layer as taught by Mis et al.

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because the titanium could prevent the under bump metallurgy layer from forming a residue on the underlying microelectronic device as taught Mis et al. (see Abstract).

18. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Byrne '364 as applied to claim 11 above, and further in view of Lou (U.S. 5,759,906).

Lou discloses as known in the art the used of a silicon oxide layer doped with fluorine as a dielectric layer used to reduce the capacitance between lines (see Abstract, col. 1, lines 55-67, col. 2, lines 5-15).

It would have be obvious to a person of ordinary skill in the art to modify Byrne's process by including a silicon oxide layer doped with fluorine as taught by Lou because it would reduce the capacitance between lines.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mu et al. (U.S. 5,612,254) discloses a metal layer having a first member spaced apart from a second member by a gap, a dielectric layer 91 (silicon dioxide), another dielectric layer 92 (silicon nitride).

Harada (U.S. 5,260,600), Bryant et al. (U.S. 5,698,456), Sharma et al. (U.S. 4,927,505) and Michael (U.S. 5,563,102) disclose several steps related to Applicant's disclosure.

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20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is (703) 305-0162. The examiner can normally be reached on Monday-Friday from 8:00 Am to 4:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (703) 308-4940. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.


Carl Whitehead, Jr.
Supervisory Patent Examiner
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August 13, 1999